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▼ Settings for "Beating the Odds - Tuttle"

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Assignment Instructions

Rhode Island Unit of Study

Title: **Beating the Odds – Exploring Probability**Overall days: **15**

Discipline/Content Area Focus:

Please identify the primary content area focus for the unit of study. This will be used for searching capabilities. You should list a discipline area such as, science, or mathematics, etc.

Mathematics

Grade Level:

Please identify the primary grade level focus for the unit of study. This will be used for searching capabilities.

Grade 6

Discipline Content:

This section contains specific content and concepts that are to be learned in this unit of study. Statements describe what students will learn related to the content and concepts.

What will students LEARN?

Organize, display and analyze data**-tables, line graphs, stem-and-leaf plots****Probability events**

- sample spaces that may or may not be equally likely
- theoretical probability
- experiments and simulations

- fair games

Processes:

This section contains the specific processes students will use in learning the content; may be referenced from GSEs/GLEs.

What will the students DO?

Students will:

Organize, display and analyze data

Formulate & justify conclusions

Make predictions

Solve problems

Determine probability

Predict outcomes

Test predictions

Design fair games

Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content and be able to:

- Use problem-solving strategies appropriately and effectively for a given situation.
- Determine, collect and organize the relevant information needed to solve real-world problems.
- Use technology when appropriate to solve problems.
- Reflect on solutions and the problem-solving process for a given situation and refine strategies as needed.

Students will communicate their understanding of mathematics and be able to:

- Articulate ideas clearly and logically in both written and oral form.
- Present, share, explain, and justify thinking with others and build upon the ideas of others to solve problems.
- Use mathematical symbols and notation.
- Formulate questions, conjectures, definitions, and generalizations about data, information, and problem situations.

Essential Questions:

This section should list the set of essential questions students should be able to answer by the end of the unit of study. These questions should be relatively broad in nature, directly related to the unit, open-ended in nature, and represent the big ideas of the unit.

How can we best represent and analyze data to solve problems? How can we justify our conclusions and make predictions based on the data?

How can we predict the probability of events in real-world situations? How can we test and verify those predictions?

How can we design a fair game? How can we prove that it is fair?

What are the most effective ways to communicate our mathematical understanding?

Written Curriculum

Grade Level Expectations/Grade Span Expectations:

The standards will be copied in their complete form including all numbering and strand information. The portions of the standard not being addressed will be marked with a strike through. This will provide clarity regarding exactly which part of the standard is actually being developed in the unit activities.

M(DSP)–6–3 **Organizes and displays data** using tables, line graphs, or stem-and-leaf plots to answer questions related to the data, to analyze the data to formulate or justify conclusions, to make predictions, or to solve problems. (Local)

M(DSP)–6–5 **For a probability event in which the sample space may or may not contain equally likely outcomes, determines** the experimental or theoretical probability of an event in a problem-solving situation. (State)

M(DSP)–6–5 **For a probability event in which the sample space may or may not contain equally likely outcomes, predicts** the theoretical probability of an event and tests the prediction through experiments and simulations; and designs fair games. (Local)

M(PRP)–8–1 **Students will use problem-solving strategies to investigate and understand increasingly complex mathematical content** and be able to:

- Use problem-solving strategies appropriately and effectively for a given situation.
- Determine, collect and organize the relevant information needed to solve real-world problems.
- ~~Apply integrated problem-solving strategies to solve problems in the physical, natural, and social sciences and in pure mathematics.~~
- Use technology when appropriate to solve problems.
- Reflect on solutions and the problem-solving process for a given situation and refine strategies as needed.

M(CCR)–8–1 **Students will communicate their understanding of mathematics** and be able to:

- Articulate ideas clearly and logically in both written and oral form.
- Present, share, explain, and justify thinking with others and build upon the ideas of others to solve problems.
- Use mathematical symbols and notation.
- Formulate questions, conjectures, definitions, and generalizations about data, information, and problem situations.

Notes, clarifications, and prerequisites regarding standards:

This section will contain an analysis of alignment of the ideas to the grade level before and after; important findings about the standards that support teachers in narrowing the idea; provide specificity where the GLEs/GSEs lack specificity. These statements should be written in complete sentences and give guidance to teachers regarding content and/or processes. This section is not about instruction, paraphrasing the GLEs/GSEs, or criteria.

Be specific about the standards that address the Essential Questions by building upon what the students have already learned and how it prepares them for what is to come. (see

examples...)

DSP 6-3 A **focal point** will be analysis of stem-and-leaf plots to answer questions about the data, formulate conclusions, make predictions and solve problems. Students will have **prior knowledge** around analysis of tables, bar graphs and line graphs to answer questions about the data and formulate conclusions. In seventh grade these concepts will be **extended** with an emphasis on choosing graphs that will best represent a particular set of data within a situation.

DSP 6-5 **Focal points** will include determining experimental and theoretical probabilities as they relate to problem solving situations. This will include designing fair games as well as simulations to test predictions. Students will have **prior knowledge** with the concept of theoretical probability along with testing these theories through experiments. This work will be **extended** in seventh grade as students compare and contrast the experimental and theoretical probabilities to draw additional conclusions.

PRP 8-1 Students will **focus** on using technology to solve problems along with reflecting on solution strategies and refining when necessary. They will have **previous experiences** with multiple solution strategies and connecting computation to real-world problem solving applications.

CCR 8-1 Students will **focus** on extending their justification skills by questioning and making generalizations. They will have **previous experiences** with sharing their thinking and representing it in more than one way.

Additional Learner Outcomes (not necessarily assessed):

Examples: 21st Century Skills, Applied Learning Skills, Technology Skills, Learner Expectations (PBGR)

Students will learn how to use functions in Kaleidos and RM Easiteach to support the creation of data sets and probability events.

Students will use functions in Microsoft Excel to organize, display and analyze data collected in probability samples.

A3a The student gathers information to assist in completing project work, that is the student:

- identifies potential sources of information to assist in completing the project;
- uses appropriate techniques to collect the information, e.g., considers sampling issues in conducting a survey;
- interprets and analyzes the information;
- evaluates the information in terms of completeness, relevance, and validity;

Taught Curriculum

Instructional Sequence:

This section contains specific recommended pacing for the unit. If the unit is a 6 day unit, in most cases each day will have a learning objective. The learning objective may or may not be the exact GLE or GSE statements and are shaped by the learning activity. Step by step "lesson plan" for teacher and students.

Day1

Teacher will assess prior knowledge of probability by having students participate in a [RAN](#) activity. A whole-group discussion will follow. Teacher will introduce the [Brownbag Probability](#) activity to allow for student exploration of probability. Following the activity wrap-up, the teacher will disseminate "[Theory and Practice-Comparing Theoretical and Experimental Probabilities Task](#)" page 1 (RM Easiteach) and lettered manipulatives for completion that evening. (note: a [Brownbag Probability follow-up](#) is available, if needed)

Students will participate in the RAN activity and discussion. They will explore probability by doing a hands-on activity. The students will complete a guided practice activity, using manipulatives and recording sheet.

Day 2

Teacher will discuss the previous evening's guided practice and have students work on page 2, #s 5 and 6, of "Theory and Practice" and create an Excel spreadsheet to display their data. Next, students will number cards and complete number 7, with their theoretical probability. Teacher will assign question #s, -8-10, experimental probability and reflective questions for homework.

Students will participate in the discussion of page 1. . In addition, they will complete an extension activity and use laptops to design an Excel spreadsheet to display their data. Students will number cards and complete #7 with a partner. That evening, students will do #8-10.

Day 3

Teacher will lead a sharing discussion, while students compose a chart representing whole-class data, using information from #8. We may, as a group, extend it into a frequency table in Excel. Teacher will explain the [Adjustable Spinner activity](#) (Shodor), and use DI strategies to meet the needs of students. Teacher will question as necessary, and lead a wrap-up. Teacher will assign ACE questions 1-7 (p. 13, [What do you Expect?](#)). Also, students will be asked to reflect on RIEPS ("Why is there a discrepancy between theoretical and experimental probability?")

Students will engage in a class discussion, and display group data. Students will engage in an interactive spinner activity, in tiered groups, to meet student needs. Students will complete questions and a reflection tonight.

Day 4

Teacher will address RAN chart, and have students make changes, where they see fit. A discussion of new learning will follow. Students will then be introduced to the "Probability of Events not Happening" worksheet. Teacher will assign "[What's in the Bag?](#)" for homework.

Students will engage in a class discussion and reflection of the RAN chart. Students will complete "Probability of Events not Happening." Students will complete "What's in the Bag?" for homework.

Day 5

Teacher will introduce students to "[Marble Mania](#)" (Shodor). He/she will walk students through 10 trials, with graphing. The teacher will have students complete the interactive activity for 50 and 100 trials, as well as record on their "Marble Mania" sheet. "[The Mania](#)

[Continues](#)" and an extension graphing activity will be explained (see [sample](#) and [rubric](#))

Students will complete "Marble Mania" and follow-up questions. They will extend their learning as they complete "The Mania Continues" and create their own graph to represent their data, and answer related questions. Students will reflect on their self reflection rubric as well as respond to a discussion RIEPS tonight.

Days 6 and 7

Teacher will introduce topics in Investigations 1.3 and 1.4 of [What do you Expect?](#) A question 10 will be assigned and used as an assessment tool. Teacher will emphasize vocabulary as we create a group concept map relating to the unit.

Students will utilize their books and extend their knowledge of probability by creating and analyzing graphs. They will participate in concept mapping relating to the unit.

Days 8 and 9

Teacher will have group engage in a brief discussion of prior work/findings from unit...big ideas we've discovered and generalizations that have been made. He/she will introduce the class to "[Spinners and Beads-Finding Probability](#)" (RM Easiteach).

Students will explain and justify their understanding of probability, fairness, and graphing options. They will work in pairs to complete "Spinners and Beads."

Days 10 and 11

Teacher will have students engage in a silent sort. He/She will explain the jigsaw/expert group model and requirements for "[A Question of Odds-Finding Probabilities Task](#)." She will debrief upon completion and assign a RIEPS reflection. A choice board will be assigned for homework.

Students will engage in a silent sort to determine their expert group. Each group will become an expert on a question. Students will then join their new jigsaw group, where each member must, using the micropresenter, explain their solution and justify their thinking. All members will be responsible for sharing, actively listening, asking clarifying questions and recording all other-members answers. Work will be submitted for a quiz grade. Students will complete a choice board tonight.

Days 12-14

Teacher will introduce the final unit project – "Make a Spinner Game" (RM Easiteach). A [sample](#) and the [rubric](#) will be provided. He/she will lead a discussion of how students may make a game using spinners, fairness (is your game fair, not fair, how would we determine that?), rules, etc. The teacher will explain that the game will be tested with a partner, then presented to another class and given feedback.

Students will create a game using spinners. They will make rules, and address the fairness of their game. Students will play their game with a partner, where they must record the theoretical and experimental probability of landing on a particular color. That evening, they will create an Excel spreadsheet to display their results. Finally, the games will be introduced to another class for sharing and feedback.

Day 15

Teacher will facilitate a Wall Talk of the big ideas of the unit. After the silent student recording, a discussion will take place of general comments that came out of the activity. The RAN chart will be re-addressed. The teacher will have students reflect on the essential questions on RIEPS tonight.

Students will take part in a silent Wall Talk activity. They will then discuss general findings.

In addition, the concept map will be extended, and the RAN chart will be re-addressed as students reflect on their prior thinking and how it has changed. As a final assessment, students will reflect on RIEPS about the essential questions.

Resources and Materials:

This section will contain all of the instructional resources and materials students will need during the unit of study.

Examples: Instructional Documents, Technology Hardware, Technology Software

What To Expect? (CMP text)

[Brownbag Probability \(Shodor\)](#)

[Brownbag Probability 2](#)

Tiered Lesson

Choice Board

[Simulations](#)

Hint Cards

Silent Sort Cards

[Gizmos](#)

[RAN Chart](#)

[Experimental vs. Theoretical \(RM\)](#)

Lettered Manipulatives (for day1 hw)

Theoretical (RM)

Probability of Events not Happening

Prob. (RM)

[Marble Mania Recording Sheets \(Shodor\)](#)

[A Question of Odds-Finding Probabilities Task \(RM\)](#) [Sam's Spinners - Make a Game Sample\(RM\)](#)

[Spinners & Beads-Finding Probability Recording Sheet \(RM\)](#)

[What's in the Bag?](#)

[Make a Game Rubric](#)

Wall Talk Prompts

[The Mania Continues](#) / [Sample](#) / [Rubric](#)

Smart Board

Micro Presenter

Laptop Cart

Kaleidos/RM Easiteach

[Interactive Spinner](#)

RIEPS

Excel

[Maths Online -](#)

[Pick a Door \(Shodor\)](#)

[Probability Simulation](#)

Marble Mania (Shodor)

Make a Spinner Game (RM)

Experimental vs.

Spinners & Beads-Finding

[Spinner Activity \(NLVM\)](#)

[Sam's Spinners - Make a](#)

Instructional Considerations:

Key Vocabulary:

This section should contain the most critical vocabulary only. This is not intended to be an exhaustive vocabulary list.

Experimental

Theoretical

Sample space

Simulation

Fair game

Differentiation Strategies (for all student learners):

Tiered Groups

Choice Board
Hint Cards
Manipulatives
Jigsaw/Expert Groups

Depth of Knowledge:

Describe (using DOK language) how these tasks require students to reach deeper levels of thinking (3 or 4 of DOK).

Students will reach a DOK of 4 by extending and synthesizing their understanding of probability by **designing** fair games and **proving** that they work through simulations. Students will reach a DOK of 3 as they **revise** when necessary based on results of experimental probability and calculations around theoretical probability. Students will **formulate** conclusions about the data collected and **cite evidence** to support their thinking. Students will **communicate** their findings to an authentic audience.

Institute for Learning (IFL) Strategies/Research Based Strategies:

Example: Accountable talk will occur as studentsor students will engage in the following Thinking Mathematics Principles...

The opening of the unit with a RAN chart and the building of a concept map throughout will both be strategies to help **Build from Intuitive Knowledge**. The unit will also be based on a variety of **Situational Story Problems** and will build **Number Sense** throughout with the consistent analysis of data as a key component in all lessons.

This unit includes a great deal of evidence around **Organizing for Effort** and **Clear Expectations**. The essential questions provided to the students upfront and referenced throughout ensure that it is standards based and expectations are fair and credible. Student work will be shared throughout and discussed to model what "good work" looks like.

Within the workshop model of launch, explore and summarize **Recognition of Accomplishment** is a natural component. Student work will be shared and celebrated on a daily basis with specific feedback provided by both teachers and peers. Monthly parent math nights will also be opportunities for student work to be showcased and for students of the month to teach parents the "new math" concepts we are exploring.

Accountable Talk and **Socializing intelligence** are also embedded in this unit as students will be working in flexible groups throughout with the purpose of: working together to clarify thinking, elaborating and building on one another ideas, constructing explanations and justifications, knowing how to ask good questions and find necessary information, tools or materials. Sakai discussion forums will also be used to support Accountable Talk in a virtual environment. Students will be asked to routinely **Explain and Justify** their thinking to the teacher, small groups of peers and whole group during the summarize phase of the lesson.

Self-Management of Learning will also be a key component as self-reflection rubrics and discussion forums on RIEPS will encourage and guide metacognition throughout the unit.

There will be a tremendous focus on using **Manipulatives and Other Representations** to develop a strong conceptual understanding of Probability. The teacher will encourage and accept **Multiple Solution Strategies** and facilitate whole group discussions to evaluate the efficiency and accuracy of strategies that are shared and presented.

Ongoing Assessment will drive the unit and is a natural result of the Mathematics Workshop model. The teacher will have multiple opportunities to listen to students talk about the mathematics and will take detailed notes on a clipboard that will help to alter and modify upcoming lessons according to the needs of the students.

The biggest challenge of this unit will be to **Balance Conceptual and Procedural Learning** because research shows that both are equally important. The manipulatives and technology will help student to develop that visualization and conceptual piece. Teacher modeling of the recording and symbols associated with this conceptual understanding is a critical piece in building that bridge for students. Multiple opportunities for students to do this recording themselves are also a key component.

Clearly there will be a **Variety of Teaching Strategies** exemplified in this unit, many of which will be described in detail in the next section of the template.

Teaching Strategies:

In this section, useful and generalizable content-focused strategies should be described as they related to the specific activities for the learning expectations and accompanying sections. Notes and comments about when it might be useful to group students in pairs or groups, tips for organizing materials, and references to specific support pages in the selected resources also go here. Teachers should also address issues regarding technology integration to explain how the technology resources will be integrated into the teaching and learning in the classroom.

Launch-Explore-Summarize:

A Launch-Explore-Summarize model will be used throughout the unit. This workshop format allows for the teacher to launch the lesson by assessing prior/intuitive knowledge and/or introducing a concept via a mini-lesson. During this launch, the teacher will explain the expectations for the class. Students will explore as they collaborate with others on a given task, while the teacher scaffolds as necessary. The summarize portion will be critical in allowing for students to share their findings and justify their thinking.

RAN(Reading and Analyzing Non-Fiction Text):

Students, at the start of the unit, will write what they think they know about probability. As the unit progresses, their original thinking may be confirmed or change. As this takes place, students will complete the confirmed and misconceptions sections of the chart. As students extend their thinking, they can fill in the new knowledge section of the chart. Throughout the unit, students may have questions about the topic; as this happens, the wonderings column can be utilized. This strategy allows for students to, throughout the unit, use metacognition and think about their thinking.

Hint Cards:

Hint cards will be available for tasks throughout the unit. Hints will be small, medium, or large, and will scaffold students without taking the thinking out of the problem by giving too much information. The students will have the opportunity to take the cards size that corresponds to the size of the hint, as needed. At times, the hint cards may simply note a connection to a similar problem that was completed at an earlier time. They may also ask a question that may lead students to think about how to address a given activity.

Choice Board:

The choice board is a DI strategy that allows for students to prove understanding of a concept, while they have freedom to complete questions based on their difficulty. The board will have three rows, each with three questions. Each row will have a one smiley face problem, which will be the least challenging, a two smiley face that will be more difficult, and a three smiley face problem, which will be the most difficult. Students must complete one question from each row.

Expert/Jigsaw Group:

With this approach, students focus on a particular task in their expert group. They become experts on the problem and get comfortable with how they may share their problem with others. This allows for all students, to have a correct answer that they have discussed within their group before having to share with others. Next, students reform groups into their jigsawed groups, each student being an expert on their particular problem. Each student will share their problem, as the others ask clarifying questions and build on the the presentation. Each student is responsible for recording all answers and corresponding work as they are shared.

Tiered Lesson:

By tiering lessons, the teacher can meet the needs of his/her students. All students will have the opportunity to meet the given standard(s), however the difficulty level of and/or task involved with the problem may vary. With this, some may be given manipulatives (concrete), while other may utilize technology, and others may not need them at all.

Concept Mapping:

Prior/intuitive knowledge surrounding the topic, probability, will be noted through the completion of a group concept map. The map will be introduced on Day 6 and referenced and extended throughout the unit.

Technology:

Technology will be an exciting way for students to explore concepts. The technology and virtual manipulatives will help students visualize results of a given situation, and will allow for them to examine simulations of experimental probabilities that will involve larger samples than would be possible in a low-tech. way.

Wall Talk:

This silent strategy will allow for students to reflect on the unit by responding to several prompts. Once students have responded on the various charts, a group discussion of the responses will take place. It will be a nice way to summarize what was learned, and how thinking may have changed throughout the unit.

Assessed Curriculum:

Assessment Options

Embedded, Formative Assessments

Frequent use of clipboard to reference student understanding/misunderstanding
 Summarize portion of Launch-Explore- Summarize Model
 Experimental vs. Theoretical (RM)
 Probability of Events not Happening
 Marble Mania (Illuminations) & The Mania Continues with rubric
 A Question of Odds-Finding Probabilities Task (RM)
 Spinners & Beads-Finding Probability (RM)
 What's in the Bag?

Summative/Unit Assessments

End of unit test

Common Tasks

Make a Spinner Game
Standards-Based Rubric

Benchmark Assessments

Same as Common Task in WW School District

Reflection

< none >

Additional resources for assignment

[Marble Mania PPT.ppt](#) (400 KB)

Goal Management Tags

There are no tags to display.

- Student view of the assignment "Beating the Odds - Tuttle"